PCR

TOPIC CATALOG

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EDVOTEK®

Designed for the Classroom
SINCE 1987

THE BIOTECHNOLOGY EDUCATION COMPANY®

EDVOTEK®

The Biotechnology Education Company®

Edvotek® was the world's ***first company*** dedicated to demystifying biotechnology for young people. In 1987, we envisioned how the emerging area of biotechnology could ***inspire*** students to choose a career in science.

Since then, Edvotek® has ***expanded*** to become the world's ***leading supplier*** of safe, affordable and easy-to-use ***biotechnology kits and equipment*** designed specifically for education.

Let us help you bring the exciting world of biotechnology into your classroom!

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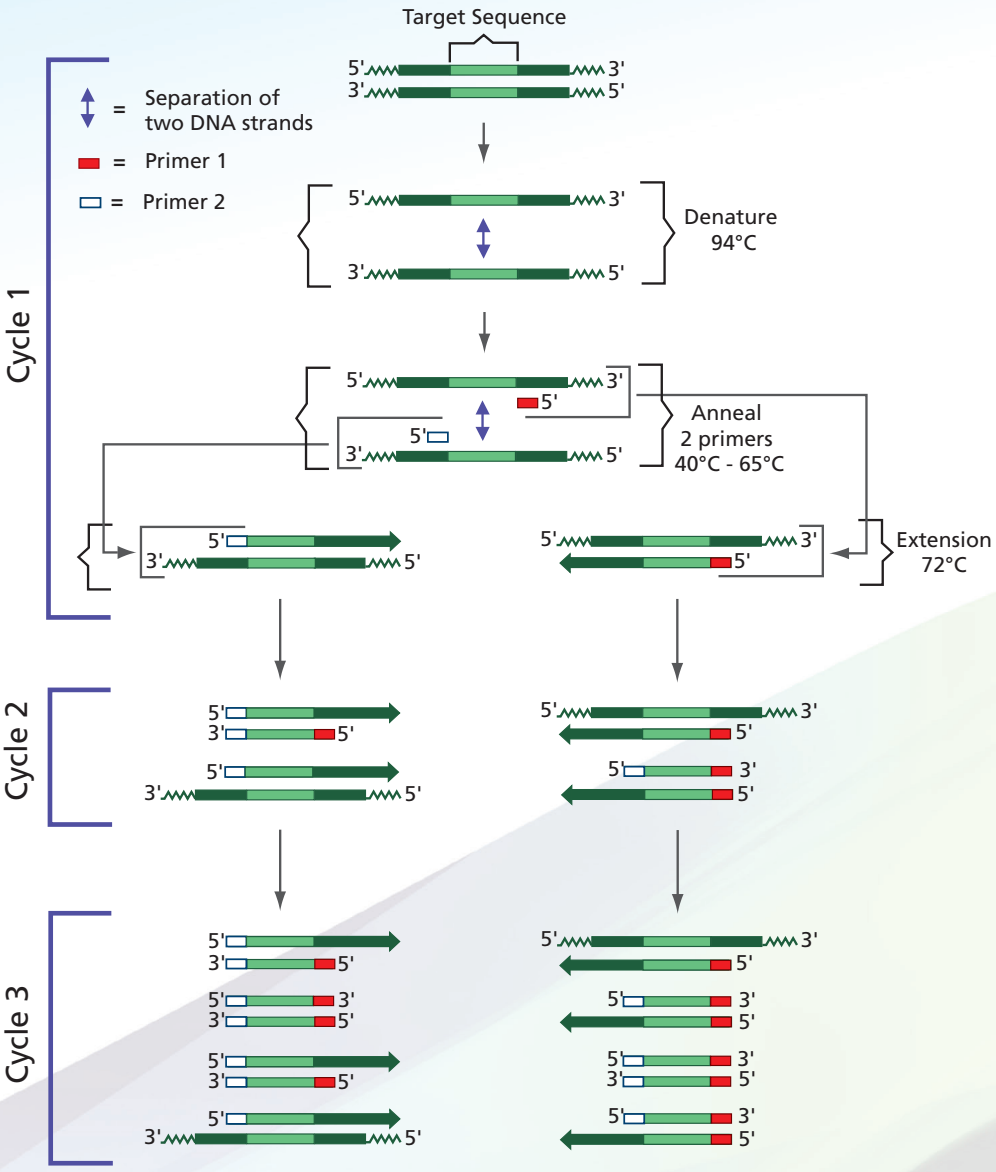
Introduction to PCR

How do forensic scientists know whose DNA was at a crime scene? How can doctors test for genetic diseases? How can we find out if our water is contaminated? The answer to all of these questions is: Polymerase Chain Reaction (PCR)! Using PCR technology, you can bring the exciting world of real-life science directly into your classroom.

In 1984, Dr. Kary Mullis revolutionized the field of molecular biology when he devised a simple and elegant method to copy specific pieces of DNA. Mullis recognized that he could replicate DNA *in vitro* using short, synthetic DNA oligonucleotides (known as primers) and DNA polymerase I in a process similar to DNA replication in a cell's nucleus. Because researchers can customize the primers to target a specific gene, this method allows for the rapid amplification of a selected DNA sequence. For the development of this technique, known today as the Polymerase Chain Reaction (or PCR), Mullis was awarded the Nobel Prize in Chemistry in 1993. Before performing PCR, template DNA is extracted from a biological sample. Two primers are designed to correspond to the 5' and 3' ends of the target sequence. The template DNA and primers are mixed with buffer, the four "free" deoxynucleotides (dATP, dCTP, dGTP, and dTTP), and a thermostable DNA polymerase (*Taq*). Next, the PCR mixture is subjected to sequential heating/cooling cycles at three different temperatures to amplify DNA.

In the first step, known as "denaturation", the mixture is heated to 94° C to disrupt the hydrogen bonds between the complementary strands. This causes the target DNA to unzip into single strands (or melt). It is important to use a thermostable DNA polymerase for PCR because this enzyme remains stable at high temperatures. In the second step, known as "annealing", the reaction mixture is cooled to 45° C - 65° C. This allows the primers to base pair with the target DNA sequence. In the third step, known as "extension", the temperature is raised to 72° C. This temperature is optimal for *Taq* polymerase to add nucleotides to the 3' end of the primer, synthesizing a new strand of DNA.

Together, these three steps - denaturation, annealing, and extension - make up one PCR "cycle". To simplify this process, a specialized machine, called a "thermal cycler" or a "PCR machine", was created to heat and cool the samples rapidly. Each PCR cycle doubles the amount of the target DNA in less than five minutes. This makes PCR a very sensitive technique, as only a few copies of the template DNA are required to produce a large amount of signal. With Edvotek®, you can bring the exciting world of PCR directly into your classroom!


Target Sequence
5'
3'
3'
5'
= Separation of two DNA strands
= Primer 1
= Primer 2
Denature 94°C
Anneal 2 primers 40°C - 65°C
Extension 72°C
Cycle 1
Cycle 2
Cycle 3

Innovations in PCR

Science evolves rapidly, and PCR is no exception.
At Edvotek®, we've created improvements to the traditional PCR experiment to make it easier, faster, and more accurate.
Your class is guaranteed to get results!

LyphoPrimer™

Instead of sending traditional liquid primer, primers developed by Edvotek® are yellow colored lyophilized solids. Lyophilization ensures both that materials last longer and that students have added the primer to their PCR mixture. No more worries about students adding all of the components or sample degradation. Just dilute and they're ready to go!

LyphoTemplate™

In addition to the primers, Edvotek® also sends lyophilized template DNA for ready-to-run PCR experiments. Both the template DNA and any DNA extractions your students perform are colored red. When mixed with the yellow primer, the samples will be orange in color. This is an easy way for students to ensure they've added all of the components and increases experimental success!

LyphoControl™

Frustrated with not having enough materials or space to run the proper experimental controls? No more! With your Edvotek® kit, you'll receive LyphoControls™, which are ready-to-run PCR controls for your experiment that already have primers, DNA, *Taq*, and buffer included. All you need to do is dilute and insert into the PCR machine!

SYBR® Safe

SYBR® Safe is a fluorescent DNA stain that binds specifically to DNA. Students can obtain safe and rapid results from their electrophoresis experiment by adding a diluted solution of SYBR® Safe to molten agarose before casting a gel. When excited with UV or blue light, any SYBR® Safe that is bound to DNA fluoresces bright green. Fluorescent DNA stains like SYBR® Safe are perfect for technically challenging experiments like PCR because they are extremely sensitive, making it easy to visualize small amounts of DNA. Gels are ready to visualize immediately after electrophoresis is completed. Use a mid-range UV transilluminator (Cat# 558) or TruBlu™ Blue Light Transilluminator (Cat# 557) to visualize gels stained with SYBR® Safe.

NEW! EdvoCycler™ 2

The sequel to the bestselling EdvoCycler™ has been fully reimagined to offer the classroom advanced PCR functionality at the lowest sample price. At 48 wells, the EdvoCycler™ 2 doubles the capacity of the original machine and offers faster performance and ease-of-use in a sleek new form factor with a vivid touchscreen display. Proudly made in the USA and backed by a 2 year warranty!

Features:

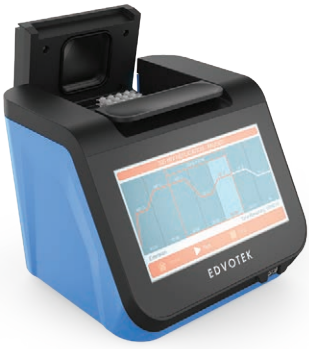
- Easy to use and program!
- Holds 48 x 0.2 mL PCR Samples & 8-Tube Strip Compatible
- 7" HD Touchscreen Displays Real-Time Cycling Data
- Edvotek® PCR Programs Included + Storage for 100 More
- Standalone Machine - No PC or Smart phone Required
- Heated Lid Prevents Sample Evaporation
- Instant Incubate Function
- Active Cooling to 4° C
- Temperature Range: 4 - 99° C
- Maximum Ramp Rate: 4° C
- 2 Year Warranty; Extended Warranty Available
- Made in USA

MADE IN THE USA

Cat# 541-542

NEW! EdvoCycler™ Jr

Scaling our EdvoCycler™ 2 down a notch, the EdvoCycler™ Jr is a perfect addition to any classroom. Boasting 16 wells and a small footprint, it is portable, efficient, and easy to use!



Features:

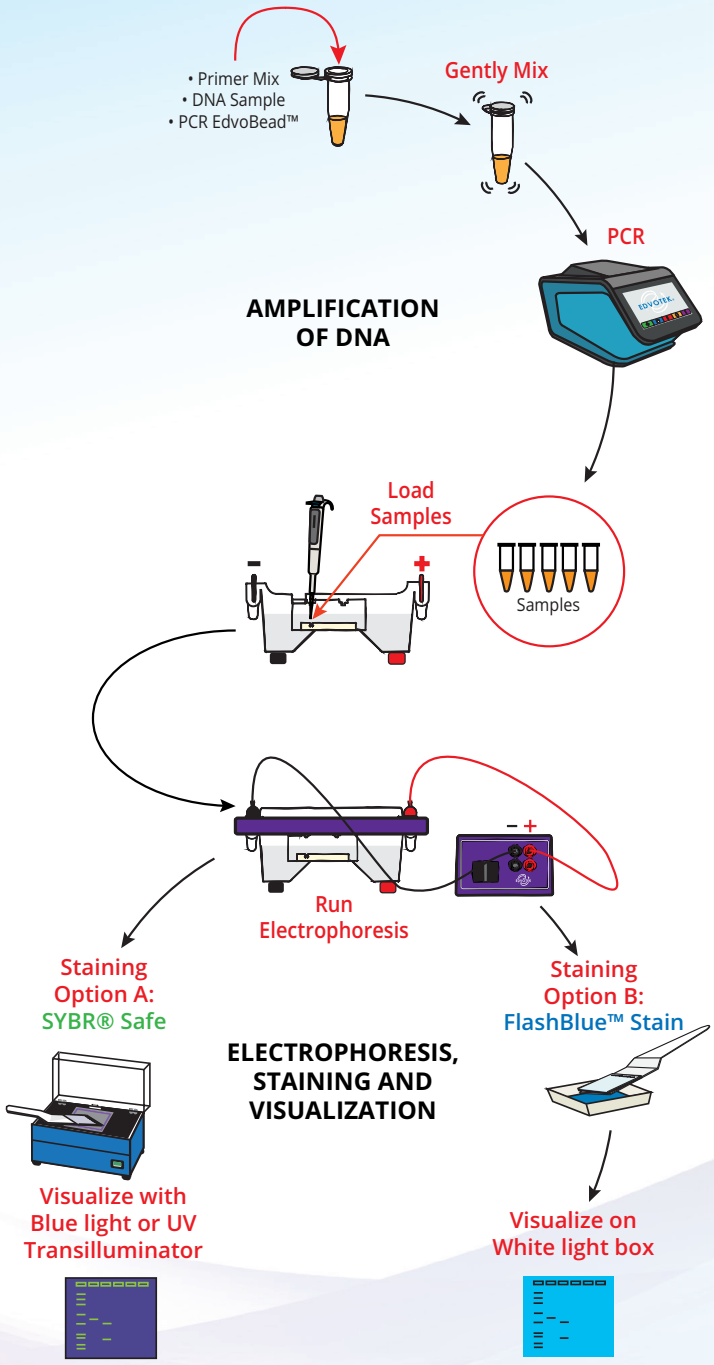
- Easy to use and program!
- Holds 16 x 0.2 mL PCR Samples & 8-Tube Strip Compatible
- 7" HD Touchscreen Displays Real-Time Cycling Data
- Edvotek® PCR Programs Included + Storage for 100 More
- Standalone Machine - No PC or Smart phone Required
- Heated Lid Prevents Sample Evaporation
- Instant Incubate Function
- Active Cooling to 4° C
- Temperature Range: 4 - 99° C
- Maximum Ramp Rate: 4° C
- 2 Year Warranty; Extended Warranty Available
- Made in USA

MADE IN THE USA

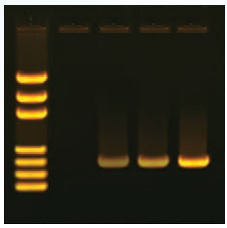
Cat# 545

Getting Started!

Want to introduce PCR to your classroom but not sure how to get started? Try one of our introductory PCR kits! These come with LyphoPrimer™ and LyphoTemplate™ making assembly of PCR components fast and easy.



PCR Amplification of DNA



In this easy PCR experiment, students will make billions of copies of a small amount of DNA in just 90 minutes! They just mix template DNA & primers with PCR beads that contain all of the other components required to carry out a PCR reaction. Students will see the increasing amounts of DNA for themselves, taking samples every 10 cycles and analyzing them on a DNA gel.

Cat# 330 ***For 10 lab groups***

Quick PCR

In this experiment, students will gain an understanding of the traditional three-step Polymerase Chain Reaction (PCR). Using PCR and Agarose Gel Electrophoresis, they will analyze a small section of Lambda DNA in a time-saving two-temperature process. In just 30 minutes your students' samples will be ready to separate using agarose gel electrophoresis!

Cat# 372 ***For 10 lab groups***

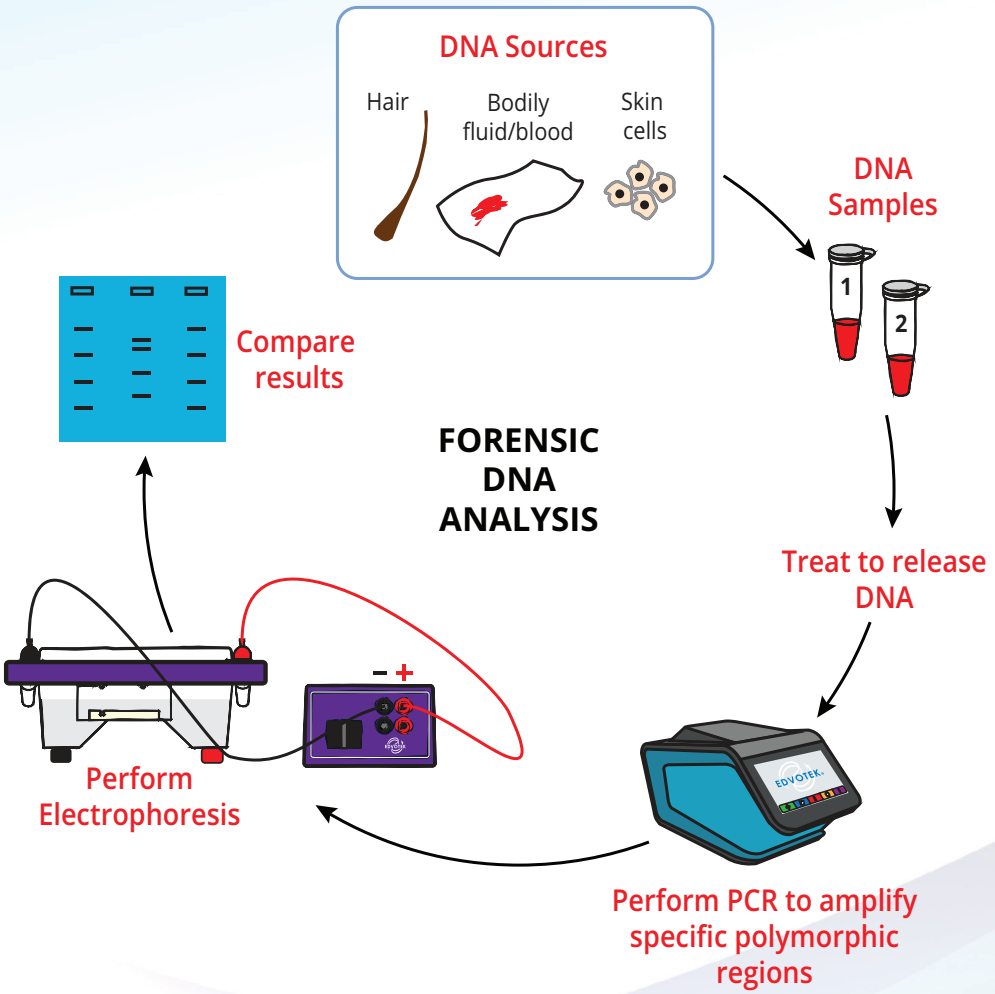
NEW! Polymerase Chain Reaction Model

Help your students understand PCR with this colorful model. Students make models of *Taq* DNA polymerase and use it to extend primers on template DNA. They can carry out as many cycles as they like with the components provided. They learn about the importance of *Taq* polymerase, that DNA is only synthesized in the 5' to 3' direction, DNA primers, the steps of PCR - denaturing, annealing and extension. Compare PCR and DNA replication using our DNA replication model.

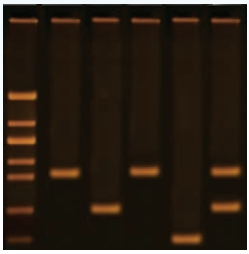
Cat# EVT-032

Using PCR to Investigate Human Health

PCR allows doctors and scientists to investigate human health by identifying changes within the genome. These can be mutations that cause disease, putting together DNA fingerprints for forensic analysis, or studying viruses and bacteria that make us sick. These kits bring DNA analysis directly into your classroom with LyphoTemplate™ and LyphoPrimer™, making it easier than ever to incorporate this technology into your classroom.



DNA Fingerprinting Using PCR



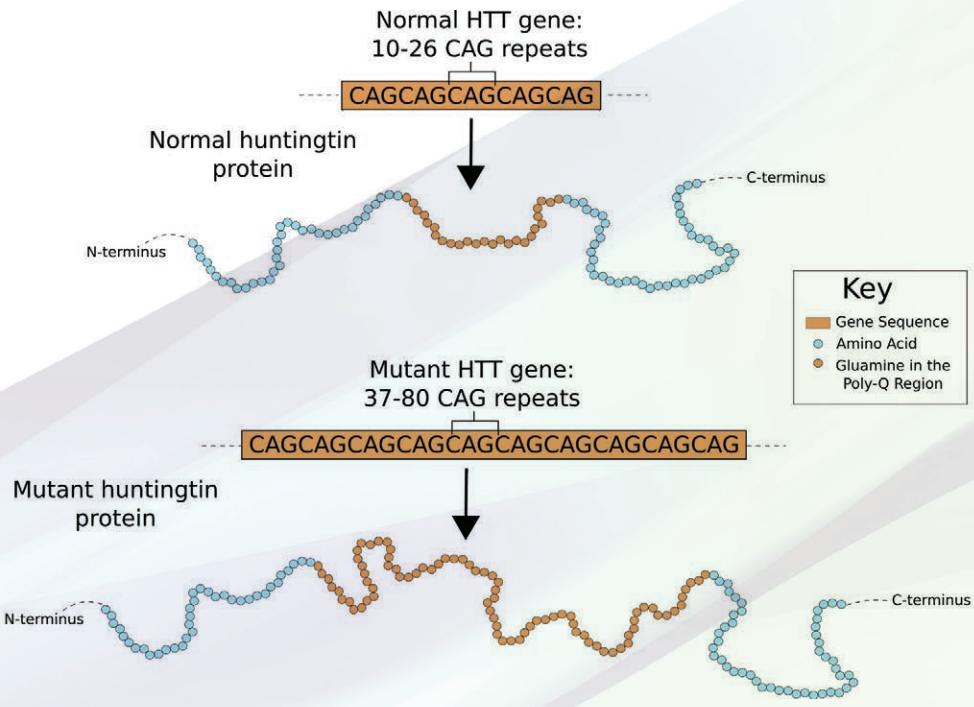
This kit provides easy to follow instructions for your students to develop various crime scene scenarios and determine the criminal! Plasmid DNA, when amplified by PCR, produces products that represent individual DNA profiles. Your students can then solve a crime!

Cat# 371 *For 25 students working in 5 groups*

NEW! Diagnosing Huntington's Disease Using PCR

Bring medical diagnostics directly into your classroom! In this experiment, students will conduct a DNA fingerprinting exercise on simulated patient samples to determine if family members are heterozygous for Huntington's Disease or homozygous for the normal HTT gene. Students will then analyze the amplified DNA segments by agarose gel electrophoresis.

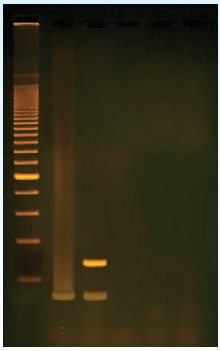
Cat# 1125 *For 5 complete sets of reactions (25 samples)*

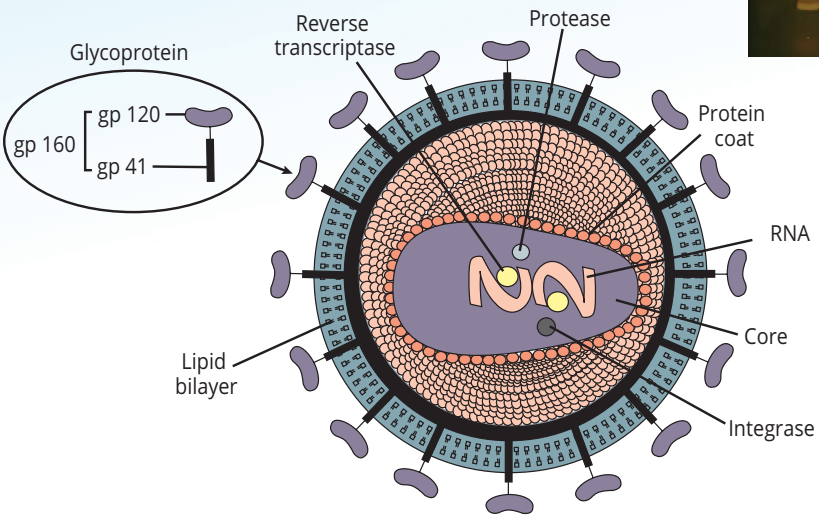


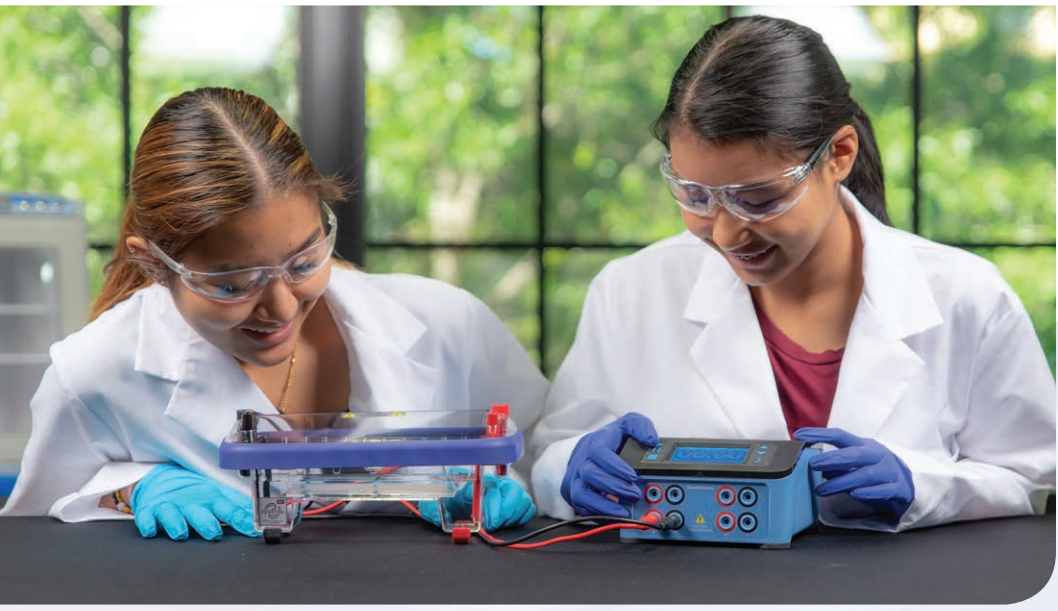
Reverse Transcription PCR (RT-PCR): The Molecular Biology of HIV Replication

A specific mRNA is reverse transcribed to double-stranded DNA. This DNA product is then amplified by PCR. This reaction demonstrates the mode of replication of HIV, which contains reverse transcriptase. This experiment is the first introduction of a commercial RNA experiment for the classroom laboratory.

Cat# 335 *For 6 lab groups*

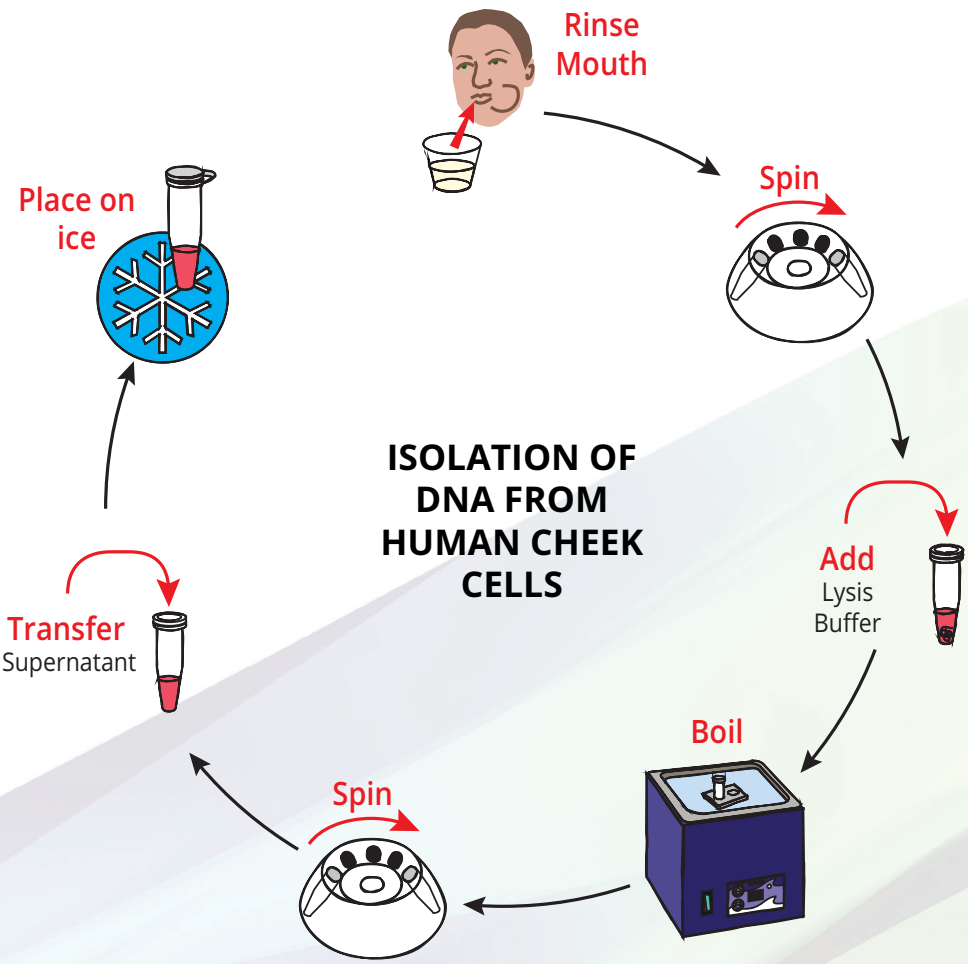




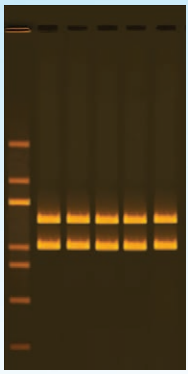


Have Students Amplify Their Own DNA!

In this set of experiments, students isolate DNA from their own cheek cells and amplify it using PCR to examine their own genes!



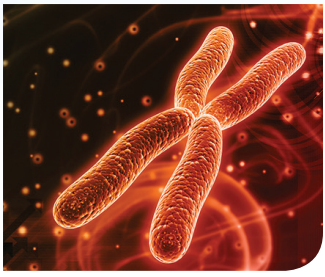
Mitochondrial DNA Analysis Using PCR



Mitochondria are thought to have evolved from a symbiotic relationship between prokaryotic and eukaryotic cells. Mitochondria have their own DNA and are inherited via the maternal line. In this experiment, your students will amplify two regions of their own mitochondrial DNA!

Cat# 332 *For 25 students*

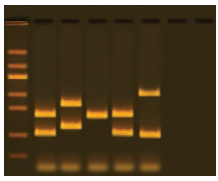
Alu Human DNA Typing Using PCR



With this kit, your students will use primers for a 300 base pair Alu insertion in chromosome 16 (PV92) to determine their own genotype! They can then compare their class results with others around the world over the internet.

Cat# 333 *For 25 students*

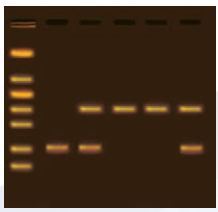
VNTR Human DNA Typing Using PCR



In DNA fingerprinting, variable number tandem repeats (VNTR) are used to identify individuals. In this kit, students will type themselves at the D1S80 locus on chromosome 1. This region contains a well studied VNTR with between 14 and 40 copies of a 16 base pair repeat.

Cat# 334 *For 25 students*

Human PCR Toolbox



Can't decide which human PCR kit to perform? Carry out three PCR experiments in your class at once! This kit provides three sets of primers to carry out the PCR amplification of Alu element (PV92) on chromosome 16, the VNTR locus (D1S80) on chromosome 1, or two regions of the mitochondrial gene.

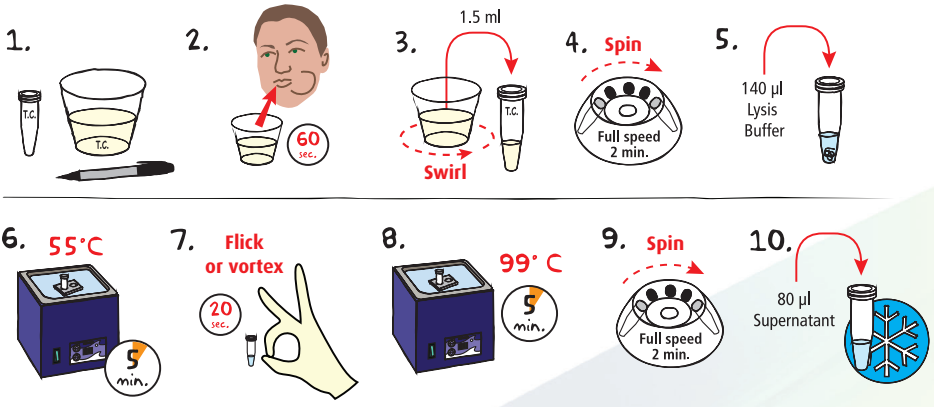
Cat# 369 *For 25 students*

Exploring the Genetics of Taste: SNP Analysis of the PTC Gene Using PCR

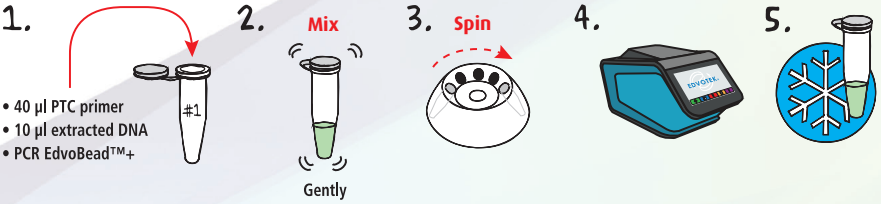
Are you a "taster"? The objective of this experiment is to identify the presence of the single nucleotide polymorphism (SNP) in an amplified segment of the PTC gene that links detection of the characteristic taste of PTC paper. This is a set of five modules that starts with (I) extraction of DNA from buccal cells, (II) amplifying the segment that contains the polymorphic nucleotide, (III) digestion of the amplified fragment with the restriction enzyme that recognizes the SNP, (IV) analysis by gel electrophoresis, and (V) tasting the PTC paper to confirm the results obtained.

Cat# 345 *For 25 reactions*

Module I: Isolation of DNA from Human Cheek Cells



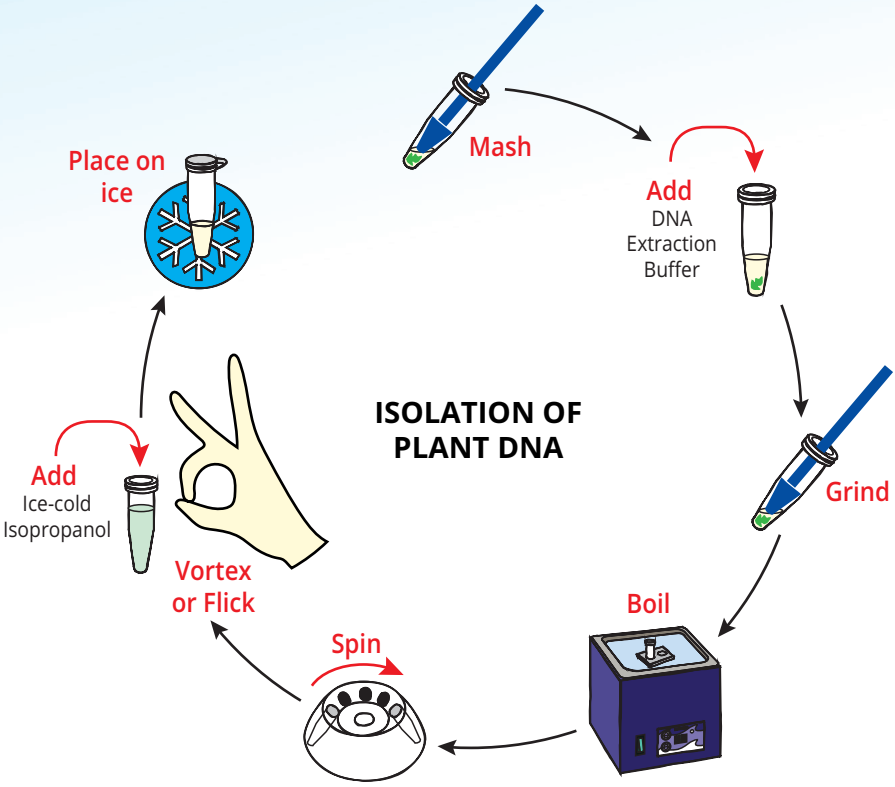
Module II: Amplification of the PTC Region



Module III: Restriction Digest of the PTC PCR Product

Using PCR to Investigate the World Around Us

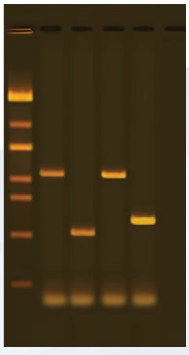
Every living organism contains DNA. That means that PCR can be used to explore all of the living things around us. You can use it to test if water is contaminated with bacteria, explore plant genomes, and identify genetically modified foods!



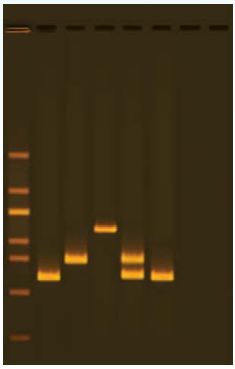
Exploring Plant Diversity with DNA Barcoding

In this inquiry-based lab, your class will explore the genetic diversity of ten selected plants. Students will isolate plant DNA and use PCR to amplify two polymorphic regions of the chloroplast genome. Digestion of PCR products and analysis by agarose gel electrophoresis will then be used to generate unique identification profiles for each plant.

Cat# 338 *For 10 lab groups*



Water Quality Testing: Multiplex PCR Testing of Water Contaminants



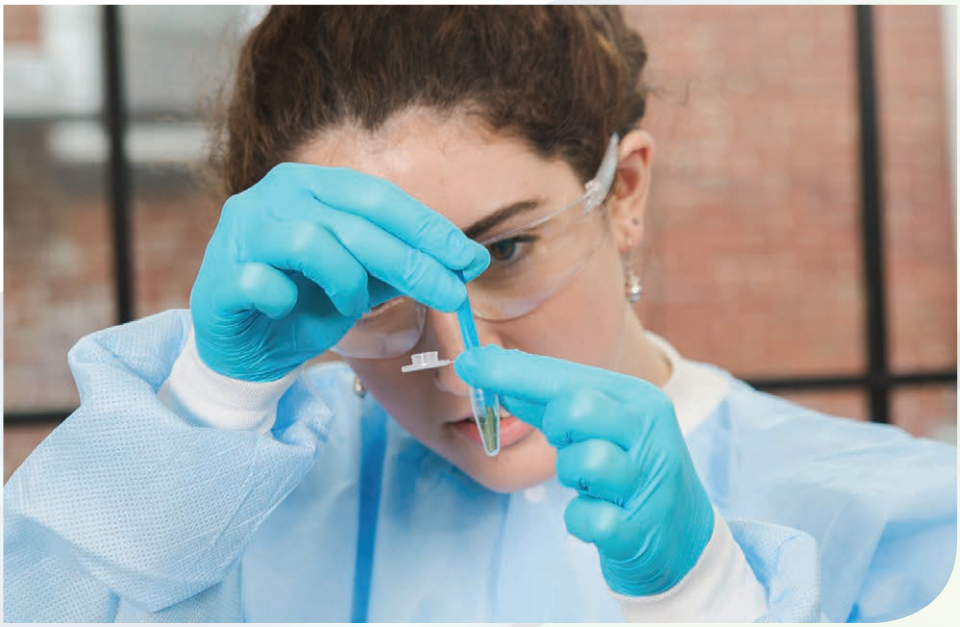
Drinking water is routinely tested for contamination. If a screening tests positive, more sophisticated tests are required. One such test uses PCR in multiplex format. In this experiment, students will test for the presence of three separate, classroom-safe organisms in a water sample using a single PCR reaction.

Cat# 953 *For 25 students*

Identification of Genetically Modified Foods Using PCR

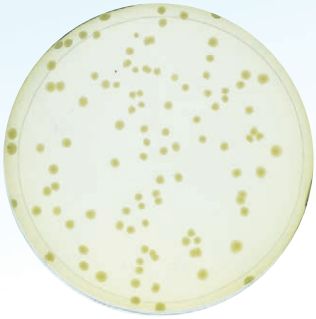
Some foods contain raw materials from genetically modified organisms (GMO). Examples include tofu, corn flakes and corn meal. In this experiment, your students will extract DNA from food or plant material and perform PCR to determine if any GM indicator genes are present. Amplified DNA is separated and sized by agarose gel electrophoresis.

Cat# 962 *For 10 lab groups*



Advanced PCR Applications

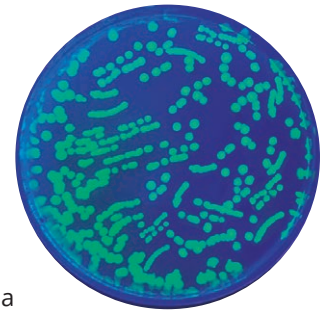
NEW! Investigating Synthetic Biology



Teach your students about synthetic biology with this exciting and exclusive lab! Students use PCR to amplify the coding sequence of the BSMT1 enzyme. This enzyme is responsible for the formation of methyl salicylate, a chemical with a strong "wintergreen" odor. The PCR product is purified, restriction digested, and inserted into a plasmid vector. The resulting recombinant DNA is then used to transform *E. coli* BactoBeads™. Finally, students design an experiment to express the enzyme from their transformants and perform a smell test to confirm that the bacterial factories are working!

Cat# 331 ***For 5 lab groups***

GFP Transformation Extension: Colony PCR



Want to incorporate PCR into your transformation experiment? Colony PCR represents a simple and easy way to determine whether cloning and transformation experiments were successful. In this experiment, students use colony PCR to analyze bacteria transformed with pFluoroGreen. A single colony is used as the DNA template for PCR. The resulting PCR sample will then be analyzed using agarose gel electrophoresis. If the bacteria have been transformed successfully, a PCR product representing the GFP gene will be produced. A bacterial housekeeping gene is amplified at the same time as a positive control. The presence of both bands is indicative of a successful transformation experiment.

Cat# 323 ***For 10 lab groups***

Drosophila Genotyping Using PCR

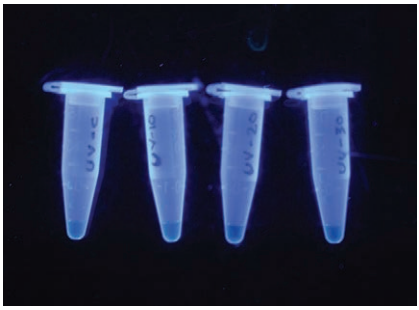
Students learn about DNA polymorphisms by amplifying DNA regions that vary between wild & mutant *Drosophila*. Amplified DNA from wild-type and white-eyed flies are separated by agarose gel electrophoresis and analyzed.

Cat# 337 ***For 10 lab groups***

NEW! Quantification of DNA Damage by qPCR

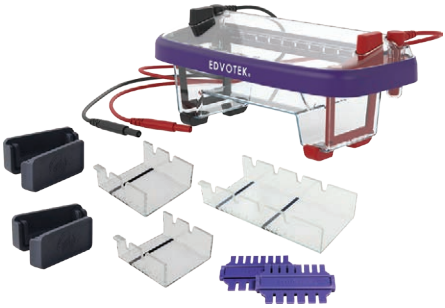
The integrity and stability of DNA is essential to life. However, everyday this molecule is under assault from environmental stressors like UV radiation, mutagenic chemicals, and even normal metabolic processes. In this guided inquiry lab, students use the cutting edge technology of qPCR to investigate and quantify DNA damage due to physical (UV radiation) or chemical (DNAse I) disruptions. By designing and performing the experiments, students will master advanced analytical and technical skills as well as deepen their understanding of key molecular biology and medical concepts.

Cat# 381 *For 4 lab groups*

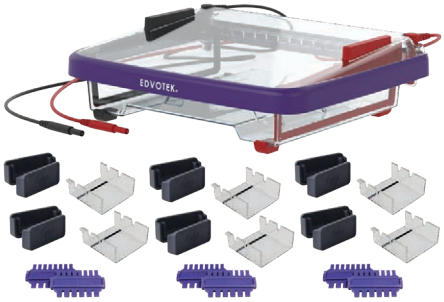


Equipment

Electrophoresis Equipment

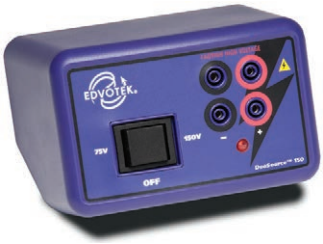


M12 Complete™ Electrophoresis Package
- For 1 or 2 Lab Groups
  Cat# 502-504



M36 HexaGel™ Electrophoresis Apparatus
- For 1 to 6 Lab Groups
  Cat# 515

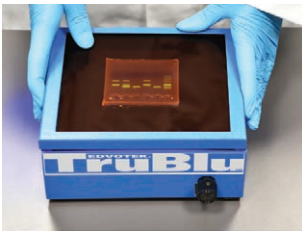
Power Supplies



DuoSource™ 150
- 75/150 V, for 1 or 2 Units
  Cat# 509

QuadraSource™
- 10-300 V, for 1 to 4 Units
  Cat# 5010

Light Sources



TruBlu™ Blue Light LED Transilluminator
Cat# 557

White Light LED Transilluminator
Cat# 552

Midrange UV Transilluminator
Cat# 558

NEW! EdvoCycler™ 2

The sequel to the bestselling EdvoCycler™ has been fully reimagined to offer the classroom advanced PCR functionality at the lowest sample price. At 48 wells, the EdvoCycler™ 2 doubles the capacity of the original machine and offers faster performance and ease-of-use in a sleek new form factor with a vivid touchscreen display. Proudly made in the USA and backed by a 2 year warranty!

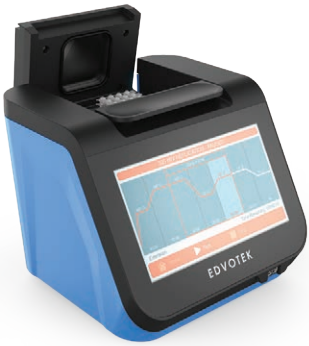
Features:
- Easy to use and program!
- Holds 48 x 0.2 mL PCR Samples & 8-Tube Strip Compatible
- 7" HD Touchscreen Displays Real-Time Cycling Data
- Edvotek® PCR Programs Included + Storage for 100 More
- Standalone Machine - No PC or Smart phone Required
- Heated Lid Prevents Sample Evaporation
- Instant Incubate Function
- Active Cooling to 4° C
- Temperature Range: 4 - 99° C
- Maximum Ramp Rate: 4° C
- 2 Year Warranty; Extended Warranty Available
- Made in USA

MADE IN THE USA

Cat# 541-542

NEW! EdvoCycler™ Jr

Scaling our EdvoCycler™ 2 down a notch, the EdvoCycler™ Jr is a perfect addition to any classroom. Boasting 16 wells and a small footprint, it is portable, efficient, and easy to use!



Features:
- Easy to use and program!
- Holds 16 x 0.2 mL PCR Samples & 8-Tube Strip Compatible
- 7" HD Touchscreen Displays Real-Time Cycling Data
- Edvotek® PCR Programs Included + Storage for 100 More
- Standalone Machine - No PC or Smart phone Required
- Heated Lid Prevents Sample Evaporation
- Instant Incubate Function
- Active Cooling to 4° C
- Temperature Range: 4 - 99° C
- Maximum Ramp Rate: 4° C
- 2 Year Warranty; Extended Warranty Available
- Made in USA

MADE IN THE USA

Cat# 545

Details for all these products and MORE can be found on our website!
www.edvotek.com

Pipettes

EDVOTEK® Variable Micropipette
- 5-50 µL Micropipette
  Cat. # 590

Fixed Volume MiniPipet™
- 35 µL MiniPipet™
  Cat. # 587-2

Water Bath

Edvotek® 1.8 L Digital Water Bath
Cat# 539

Microcentrifuges

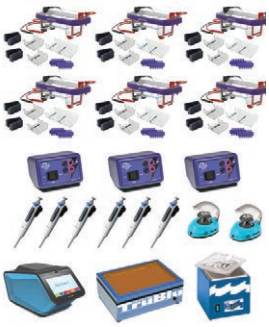
Piccolo™ Microcentrifuge
Cat# 534

Mezzo™ Microcentrifuge
Cat# 533

Details for all these products and MORE can be found on our website!

www.edvotek.com

Comprehensive LabStations™



Classroom PCR LabStation™
For up to 25 Students
Cat# 5067

Comprehensive Biotechnology LabStation™
For up to 48 Students
Cat# 5068

Ultimate Biotechnology LabStation™
For up to 64 Students
Cat# 5069

Reagents

PCR EdvoBeads™

PCR EdvoBeads™ provide the reagents for 25 PCR reactions in a convenient ambient-temperature-stable bead. PCR Beads have been optimized for PCR reactions and contain buffer, nucleotides and Taq DNA Polymerase. The only reagents that must be added to the reaction are template DNA and specific primers.
Cat# 625 25 Beads

Stains and Visualization

- **SYBR® Safe Stain**
  Cat# 608 For 750 mL
- **FlashBlue™ DNA Staining System**
  Cat# 609 For 1.2 L
- **InstaStain® Ethidium Bromide**
  Cat# 2001 For 40 gels, 7x7 cm
- **InstaStain® Blue, 7 x 7 cm**
  Cat# 2003 For 40 gels, 7x7 cm
- **10X Gel Loading Solution**
  Cat# 606 Yields 5 mL

Agarose and Buffer

- **Melt & Pour UltraSpec-Agarose™**
  Cat# 601 400 mL
  Cat# 601-B 5 x 400 mL
- **UltraSpec-Agarose™**
  Cat# 605-3g
  Cat# 605-20g
  Cat# 605-100g
  Cat# 605-500g
- **Electrophoresis Buffer 50x TAE**
  Cat# 607 100 mL
  Cat# 607-XL 500 mL
- **TBE Powdered Electrophoresis Buffer**
  Cat# 607-1 For 5 Liters

Packages

- **Electrophoresis Package with FlashBlue™**
  Includes: UltraSpec-Agarose™ (10 g), 100 mL Electrophoresis Buffer (50x), 0.5 mL Gel Loading (10x) Solution with tracking dye, and FlashBlue™ stain (for 1.2 L).
  Cat. #604

DNA Markers

- **DNA Standard Marker**
  Cat. #750-1 For 20 gels
- **100 bp DNA Ladder**
  Cat. #755 For 20 gels
- **200 bp DNA Ladder**
  Cat. #756 For 20 gels

Practice

- **Practice Gel Loading Solution**
  Cat# 606-P 5 mL
- **DNA DuraGel™**
  6 reusable DNA DuraGels™, 4 FlashBlue™ & 4 Ethidium Bromide gel images, practice gel loading solution and mini-transfer pipets.
  Cat# S-43 For 12 to 24 students

Contact Us:

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Mail: 1121 5th Street NW, Washington, DC 20001 USA

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Cell Biology | Neurobiology | & More!

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